

NSW Learning Analytics Working Group

Experiences with an Adaptive Learning Product

**adaptive testing
confidence and proficiency
analytics**

**Jurgen Schulte
SciMERIT
School of Mathematical and Physical Sciences
University of Technology Sydney**

Computerise Adaptive Testing

Presentation of educational material

according to students' learning needs

AI	1970s	(SCHOLAR, adaptive & intelligent learning systems)
	1980s	(Intelligent Tutoring Systems)
	1990s	(Adaptive Learning Technology)
	2000s	(AutoTutor, passed Turing test)

Adaptive Learning



WileyPLUS

Halliday, Fundamentals of Physics, 10e

Physics

Home Read, Study & Practice Assignment Gradebook ORION

Hello, **Jurgen Student**

You are logged into:
Halliday, Fundamentals of Physics, 10e
Physical Modelling (S2015)

Instructor(s): Michael Braun, KENDAL MCGUFFIE, Albert Ong, JURGEN SCHULTE
[Show Finished Class Sections](#)

Notifications (edit settings)

- System Announcements**
- Class Announcements**
- Course Materials**

Read, Study & Practice
Readings and resources for self-guided study, including the entire text of the Wiley book in use for your class.

Assignments
See all the assignments available for your class.
[This class has 63 assignments](#)

Gradebook
Shows the scores and statuses for all the assignments you have completed or attempted to date.

ORION
A fun place to practice and build your proficiency on topics.

Now with: ORION
An Adaptive Learning Experience

WileyPLUS Technical Support
Click here

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Version 4.17.1.1

B Engineering Honours
BE DipEngPrac
BEngSci LLB
BE (Hons) BA Int St
BE (Hons) BMedSc
BE (Hons) BSci
BEng (Hons) DipProfEngPrac
BEng (Hons) DipProfEngPrac
BEng (Hons) BBus
BEng (Hons) BCIInn
Study Abroad Undergraduate

... various sub-majors

Adaptive Learning - Student's View

WileyPLUS **ORION** Fundamentals of Physics 10e ORION

Student, Jur...

All Activity My Journal

Now Sep 2015

Filter: All Chapters All Objectives All Activity Types

Completed a Diagnostic
Sep 17, 2015 11:42:02
Ch 5: Force and Motion-I
Attempted 23 questions for chapter - "Ch 5: Force and Motion-I"
Proficiency: 27%
Time Spent: 00:11:08

Completed a Practice Session
Sep 17, 2015 11:30:29
Ch 2: Motion Along a Straight Line
Attempted 3 questions for objective - "2.3 Interpret acceleration algebraically and graphically."
Proficiency: 5%
Time Spent: 00:01:46

Completed a Practice Session
Sep 17, 2015 11:24:33
Ch 2: Motion Along a Straight Line
Attempted 7 questions for objective - "2.2 Interpret velocity and speed algebraically and graphically."
Proficiency: 12%
Time Spent: 00:01:18

Completed a Diagnostic
Sep 17, 2015 11:19:28
Ch 18: Temperature, Heat, and the First Law of Thermodynamics
Attempted 28 questions for chapter - "Ch 18: Temperature, Heat, and the First Law of Thermodynamics"
Proficiency: 5%
Time Spent: 00:18:51

Started a Discussion
Replied to a Discussion
Posted a Note
Deleted a Note
Updated a Note
Marked a Question for Review
Completed a Practice Session
Completed a Diagnostic

WileyPLUS **ORION** Fundamentals of Physics 10e ORION

Student, Jur...

BUILD YOUR PROFICIENCY [Learn More](#)

Ch 1: Measurement

Express the length of an object in SI units.
Define methods for measuring time.
[Begin](#)

Ch 2: Motion Along a Straight Line [Practice](#)

	Proficiency	Performance
Relate position, displacement, and velocity in one dimension.		1/32
Interpret velocity and speed algebraically and graphically.	12%	Study Practice
Interpret acceleration algebraically and graphically.	5%	1/9
Relate constant acceleration to changes in displacement.	38%	3/35
Employ relations of constant acceleration in the special cases of free fall and constant acceleration.		0/11

Ch 3: Vectors [Practice](#)

	Proficiency	Performance
Add and subtract vectors geometrically.		0/1
Add and subtract vectors algebraically.		

Summary

Most Time Spent

2 Hrs 10 Mins

Least Proficient Chapters

Chapter	Proficiency
Ch 6	1%
Ch 2	3%
Ch 18	5%
Ch 19	5%
Ch 4	13%
Ch 5	27%
Ch 7	65%

WileyPLUS **ORION** Fundamentals of Physics 10e ORION

Student, Jur...

Most Challenging Activities

View By Chapters View By Objectives

Chapters	Proficiency	Performance
Ch 3: Vectors		0/1
Ch 8: Potential Energy and Conservation of Energy		0/2
Ch 10: Rotation		2/3
Ch 21: Coulomb's Law		0/8
Ch 6: Force and Motion-II	1%	17/118
Ch 2: Motion Along a Straight Line	3%	10/100
Ch 18: Temperature, Heat, and the First Law of Thermodynamics	5%	9/30
Ch 19: The Kinetic Theory of Gases	5%	3/7
Ch 4: Motion in Two and Three Dimensions	13%	6/25
Ch 5: Force and Motion-I	27%	11/23
Ch 7: Kinetic Energy and Work	65%	17/18

About this report

The Most Challenging Activities report in ORION sorts objectives and chapters by Proficiency, starting with the lowest.

[Learn more](#)

Other reports

- [Metacognitive Report.](#)
- [Performance Report.](#)
- [Productivity Report.](#)

Adaptive Learning - Student's View



Practice - 11.2: Solve for kinematics of a rolling body. - Practice

TIME SPENT
00 : 02 : 00

disciplinary skill

Q 11.1: Two identical disks, with rotational inertia $I (= 1/2 MR^2)$, roll without slipping across a horizontal floor and then up inclines. Disk A rolls up its incline without sliding. On the other hand, disk B rolls up a frictionless incline. Otherwise the inclines are identical. Disk A reaches a height 12 cm above the floor before rolling down again. What height above the floor does disk B reach?

cm

↑
skills required to solve problem
no multiple guess choice

↑
quantitative problem

confidence level
time to solve
proficiency, not performance



Performance in Last 10 Qs

track record on this topic



About this Question

Question Difficulty

Difficulty



39.8%

Students got it correct

level of challenge



☐ Mark for Review

Confidence



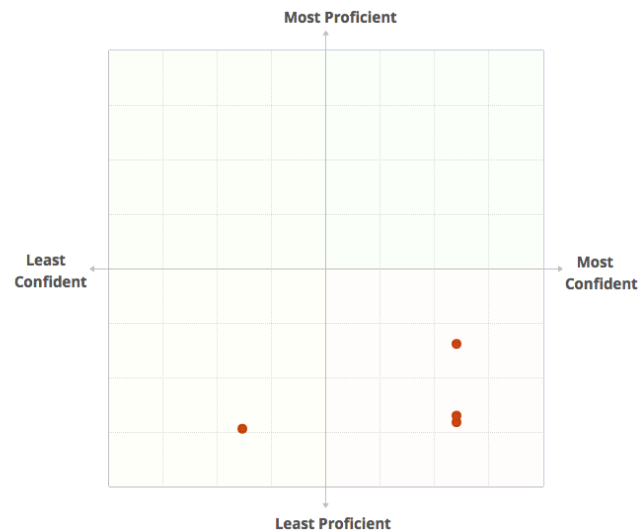
SUBMIT

Next round of problems depends on how this round of 10 problems has been completed

Adaptive Learning - Student's View

Metacognitive Report (Chapters)

Metacognitive Report



About this report

The Metacognitive Report compares your Proficiency in ORION to your confidence level. Metacognition is the awareness and understanding of your own thought process.

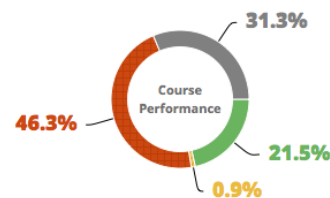
- > Hover over a point in the graph to see chapter details. You can decide to Study or Practice on that chapter.
- > Click on a point in the graph to see your Proficiency results by chapter objectives. You can then click on a point to Study or Practice specific objectives.

[Learn more](#)

Performance

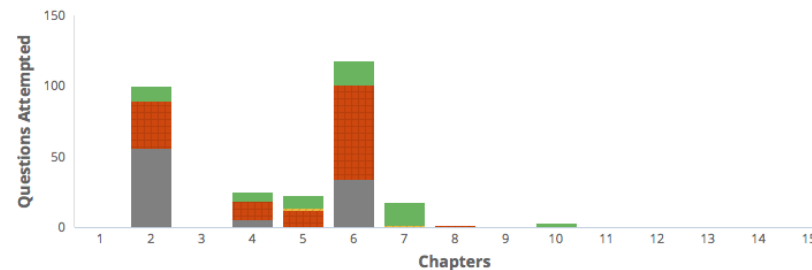
Performance Report

Course Performance Summary



- Correct
- Partially Correct
- Incorrect
- Skipped

Course Performance by Chapters



Performance

Filter Questions

Show All C... Show All

Show All Objectives

Sort By: Most Recent

Q 5.23 A box of bananas is sen... Difficulty: 2s

Q 5.22 A box of bananas is sen... Difficulty: 2s

Q 5.21 Two blocks with masse... Difficulty: 2s

Q 5.20 A feather, a golf ball an... Difficulty: 2s

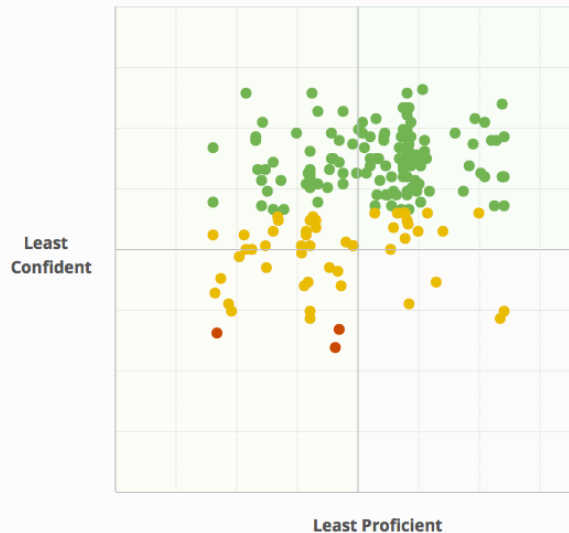
Q 5.19 A 25 kg box is pulled at ... Difficulty: 2s

Q 5.18 A 25 kg box is held stati... Difficulty: 2s

Adaptive Learning - Manager View

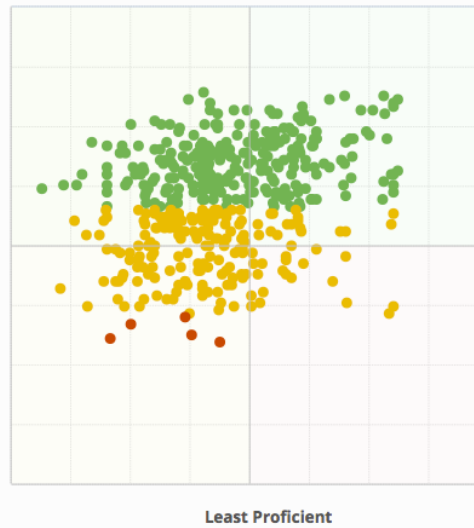
Week 3

Most Proficient



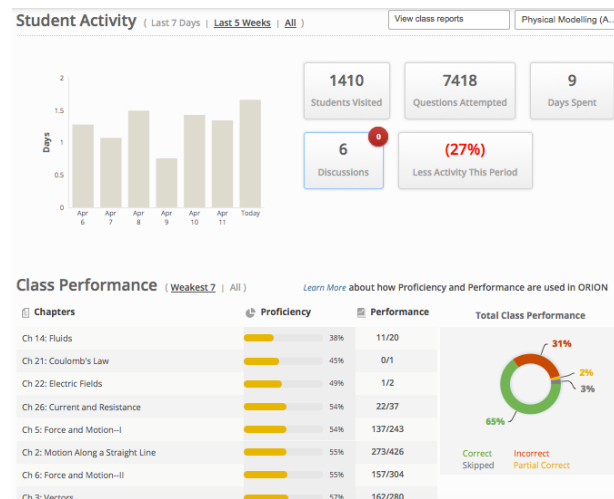
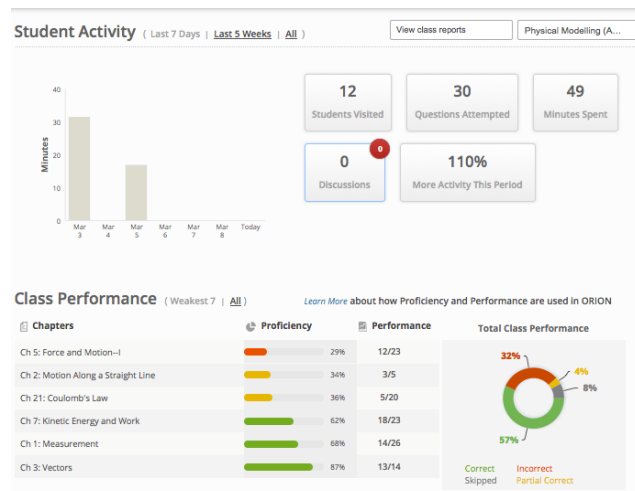
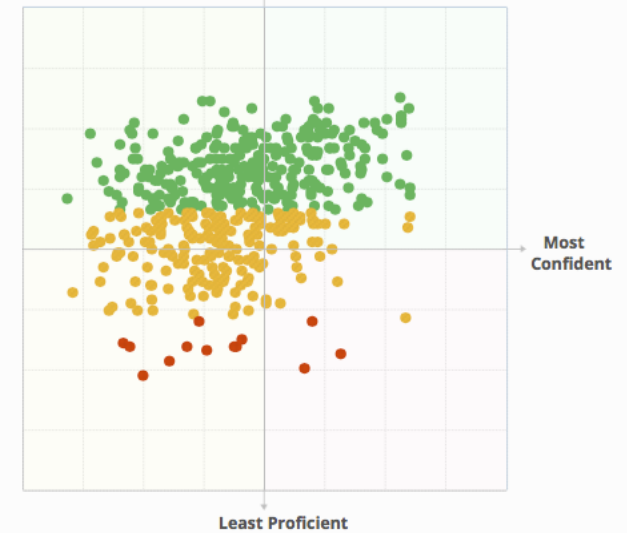
Week 8

Most Proficient

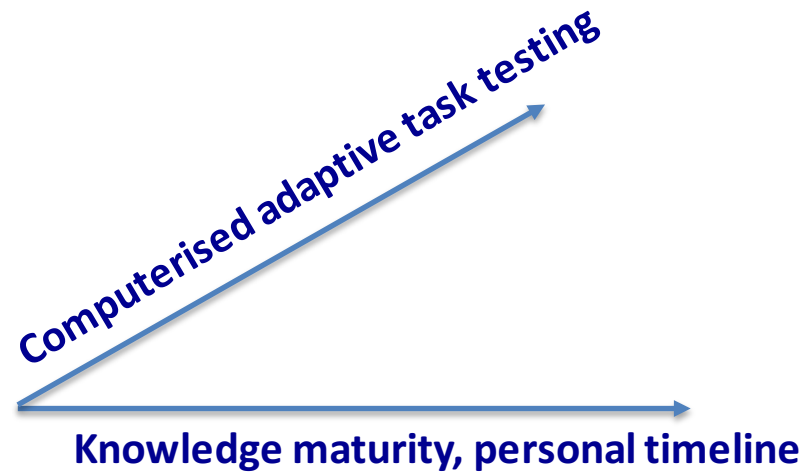


Week 12

Most Proficient



Adaptive Learning 2D



d-analysis motion forces statics momentum energy thermal electricity fluids waves optics

‘Adaptive Learning’ (2D)

Adaptive to ...

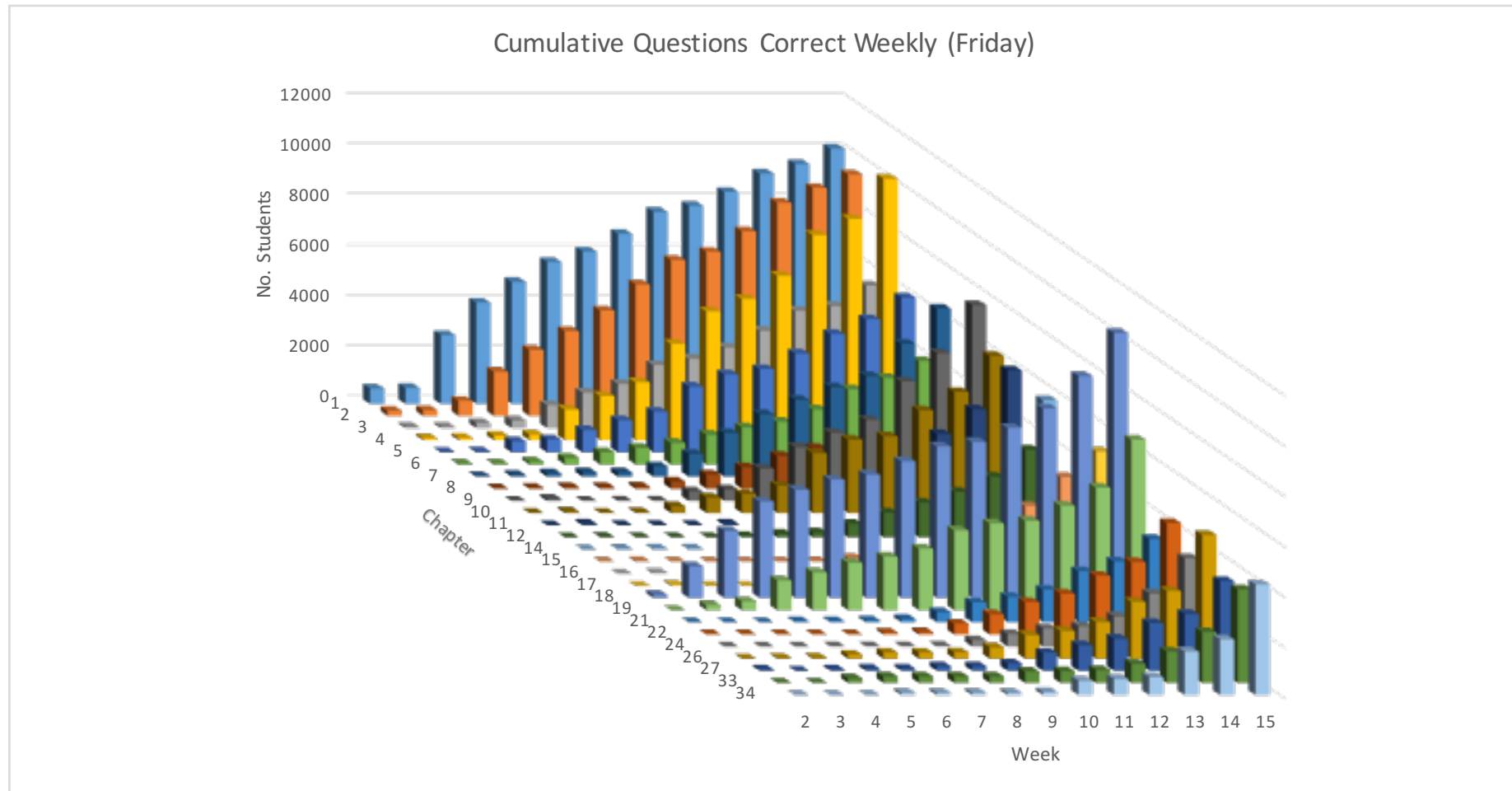
- | | |
|---------------------------------|--|
| • learning ability | flexible low to high level entry |
| • learning load | 24/7 access, all semester long |
| • personal circumstances | continuous incremental work |
| • personal interest | start and work on preferred topics |
| • building up skills | continue any time where left off last |

Data extraction, preparation, analytics ...

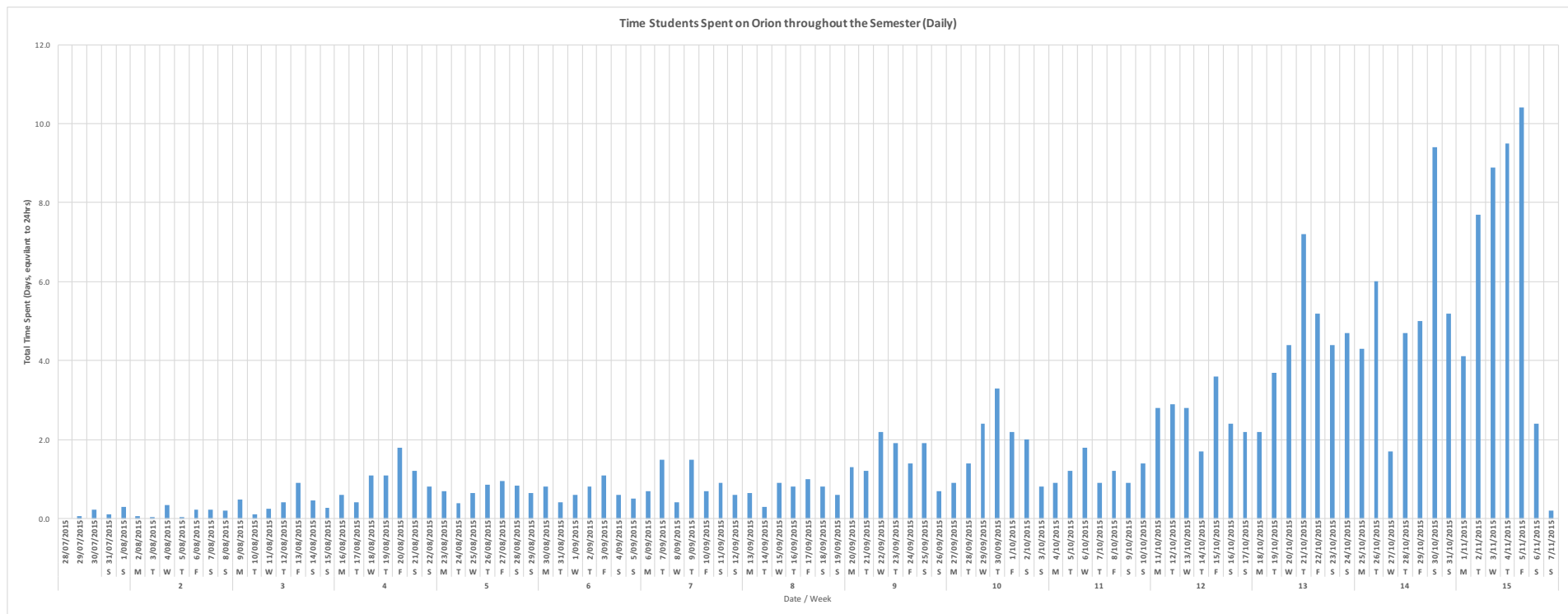
F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
Chapter 1	Chapter 1	Chapter 1	Chapter 2	Chapter 2	Chapter 2	Chapter 2	Chapter 3	Chapter 3	Chapter 3	Chapter 3	Chapter 4	Chapter 4	Chapter 4	Chapter 4	Chapter 5	Chapter 5	Chapter 5	Chapter 5	Chapter 6	Chapter 6	Chapter 6	Chapter 6	Chapter 7	Chapter 7	Chapter 7	
79%	(59/74)	1 hr 35 m	0%	90%	(13/14)	5 min 19	0%	75%	(38/57)	43 min 3	0%	73%	(31/43)	31 min 40	0%	86%	(12/14)	8 min 51	0%	99%	(13/13)	5 min 47	0%	91%	(11/11)	3 min 51
88%	(223/252)	3 hr	0%	73%	(93/128)	2 hr 32 m	0%	82%	(30/43)	38 min 5	0%	65%	(125/148)	2 hr 32 m	0%	98%	(35/41)	25 min 4	0%	97%	(37/45)	48 min 10	0%	87%	(41/47)	47 min 3
71%	(125/156)	2 hr 2 min	0%	82%	(58/75)	1 hr 1 min	0%	84%	(42/57)	37 min 10	0%	61%	(59/77)	54 min 4	0%	49%	(50/63)	38 min 5	0%	76%	(32/42)	32 min 3	0%	80%	(34/40)	15 min 6
82%	(148/180)	3 hr 33 m	25%	88%	(161/214)	5 hr 22 m	0%	91%	(101/134)	3 hr 57 m	78%	80%	(94/115)	2 hr 54 m	40%	86%	(47/69)	1 hr 34 m	0%	95%	(45/59)	1 hr 28 m	78%	81%	(40/41)	36 min 5
64%	(74/120)	2 hr 33 m	0%	64%	(48/74)	58 min 50	0%	70%	(23/30)	1 hr 7 min	0%	64%	(21/30)	29 min 1	0%	62%	(17/22)	25 min 4	0%	95%	(15/15)	14 min 1	0%	89%	(26/33)	29 min 2
68%	(140/188)	4 hr 48 m	0%	63%	(72/114)	4 hr 32 m	0%	74%	(31/43)	1 hr 37 m	0%	86%	(115/153)	5 hr 5 min	0%	94%	(77/89)	5 hr 8 min	0%	92%	(38/46)	2 hr 42 m	0%	90%	(170/180)	6 hr 12 m
77%	(76/115)	4 hr 25 m	0%	90%	(121/140)	14 hr 44	0%	93%	(58/82)	17 hr 37	0%	80%	(102/126)	5 hr 12 m	0%	77%	(87/109)	9 hr 37 m	0%	97%	(58/62)	15 hr 19	0%	75%	(94/105)	9 hr 34 m
76%	(17/20)	56 min 5	52%		(2/26)	12 min 30	0%		(2/4)	5 min 18	0%		(1/3)	1 min 21	0%		(3/10)	23 min 5	0%		(0/4)	9 min 17	70%	52%	(12/23)	20 min 4
19%	(12/20)	34 min 59 sec																								
60%	(109/165)	4 hr 9 min	0%	63%	(101/170)	4 hr 54 m	0%	64%	(186/246)	5 hr 55 m	0%	62%	(126/165)	1 hr 54 m	0%	61%	(115/175)	1 hr 58 m	0%	68%	(63/82)	41 min 8	0%	68%	(145/160)	1 hr 53 m
80%	(286/335)	15 hr 50	0%	92%	(43/50)	52 min 4	0%	85%	(166/212)	4 hr 53 m	0%	85%	(196/235)	5 hr 31 m	0%	87%	(69/91)	2 hr 8 min	0%	97%	(51/66)	1 hr 39 m	0%	89%	(51/55)	58 min 3
51%	(13/20)	25 min 4	21%	30%	(14/23)	54 min 42 sec																				
	(7/20)	26 min 2	20%	39%	(11/21)	25 min 2	0%		(6/9)	9 min 26																
52%	(22/35)	45 min 4	0%	71%	(58/77)	2 hr 47 m	0%	96%	(10/10)	12 min 1	0%	86%	(52/61)	2 hr 51 m	0%	94%	(38/46)	1 hr 57 m	0%	87%	(8/10)	42 min 18	0%	81%	(41/46)	2 hr 51 m
76%	(86/118)	2 hr 2 min	0%	87%	(88/113)	2 hr 52 m	0%	78%	(38/56)	1 hr 24 m	0%	80%	(83/101)	1 hr 54 m	0%	88%	(30/43)	51 min 7	0%	72%	(39/64)	2 hr 29 m	0%	76%	(64/89)	2 hr 47 m
45%	(13/20)	38 min 5	25%	30%	(17/41)	1 hr 37 m	0%	42%	(23/42)	2 hr 5 min	38%	10%	(21/40)	1 hr 20 m	22%	37%	(21/40)	44 min 27 sec								
18%	(20/42)	56 min 4	0%	61%	(70/86)	5 hr 36 m	0%	98%	(38/48)	2 hr 49 m	0%	80%	(36/47)	2 hr 52 m	0%	95%	(35/42)	2 hr 34 m	0%	96%	(36/41)	2 hr 30 m	0%	81%	(57/60)	3 hr 49 m
74%	(40/54)	34 min 1	0%	72%	(59/81)	1 hr 3 min	0%		(7/9)	8 min 39	0%	27%	(21/40)	26 min 5	0%	69%	(30/46)	29 min 4	0%	90%	(31/40)	25 min 5	0%	76%	(57/64)	41 min 6
84%	(238/278)	10 hr 19	0%	96%	(37/40)	3 hr 31 m	0%	82%	(34/40)	3 hr 55 m	0%	87%	(44/48)	1 hr 52 m	0%	98%	(43/44)	2 hr 23 m	0%	84%	(50/60)	4 hr 6 min	0%	70%	(72/75)	6 hr 16 m
72%	(104/112)	4 hr 42 m	84%	93%	(46/47)	1 hr 20 m	0%	99%	(47/51)	2 hr 49 m	0%	87%	(43/74)	1 hr 54 m	86%	87%	(68/70)	3 hr 31 m	0%	87%	(33/46)	1 hr 11 m	3%	65%	(78/98)	2 hr 33 m
73%	(61/83)	2 hr 8 min	0%	93%	(71/100)	1 hr 33 m	0%	100%	(40/66)	1 hr 37 m	0%	91%	(141/238)	3 hr 13 m	0%	99%	(42/86)	2 hr 13 m	0%	96%	(40/55)	1 hr 4 min	0%	84%	(57/67)	1 hr 57 m
64%	(82/110)	1 hr 50 m	0%	74%	(80/117)	1 hr 19 m	0%	4%	(11/27)	12 min 5	0%	14%	(36/64)	1 hr 12 m	0%	56%	(58/92)	1 hr 24 m	0%	92%	(31/38)	38 min 4	0%	75%	(122/141)	1 hr 16 m
81%	(320/418)	4 hr 13 m	0%	80%	(385/451)	4 hr 49 m	0%	85%	(114/151)	1 hr 3 min	0%	82%	(180/221)	1 hr 8 min	0%	86%	(72/95)	47 min 9	0%	85%	(48/52)	46 min 5	0%	87%	(117/134)	1 hr 2 min
55%	(172/224)	4 hr 52 m	0%	80%	(206/329)	2 hr 3 min	0%	83%	(45/69)	50 min 5	0%	78%	(80/115)	1 hr 22 m	0%	94%	(44/59)	41 min 5	0%	99%	(44/57)	1 hr 39 m	0%	83%	(35/44)	26 min 5
82%	(81/108)	2 hr 7 min	0%	92%	(137/177)	3 hr 41 m	0%	99%	(57/75)	2 hr 14 m	0%	87%	(184/222)	4 hr 14 m	0%	91%	(68/87)	1 hr 41 m	0%	94%	(38/46)	1 hr 19 m	0%	84%	(183/192)	9 hr 13 m
81%	(32/37)	1 hr 23 m	0%	80%	(62/76)	4 hr 10 m	0%	79%	(43/58)	3 hr 45 m	0%	83%	(128/142)	7 hr 20 m	0%	75%	(107/121)	9 hr 14 m	0%	93%	(38/40)	2 hr 11 m	0%	73%	(147/152)	7 hr 49 m
75%	(18/23)	30 min	0%	84%	(40/52)	1 hr 6 min	0%	80%	(39/60)	1 hr 18 m	0%	71%	(106/129)	2 hr 7 min	0%	70%	(54/87)	1 hr 27 m	0%	92%	(35/41)	40 min 3	0%	77%	(37/40)	35 min 2
76%	(18/21)	37 min 5	0%	28%	(23/49)	1 hr 38 m	0%		(3/7)	31 min 3					0%	54%	(16/29)	50 min 2					0%	0%	(0/1)	1 min 34
	(8/31)	11 min 5					0%	11%	(2/5)	2 min 10																

... feed into weekly **Personal Support Actions**

Adaptive Learning Analytics



Adaptive Learning Analytics



Analytics triggered PSA

- **Weekly personalised emails**
 - **Status report**
 - **Expectations**
 - **Encouragement / Caution**
 - **Progress support**
 - **Early warning flags**

ORION

Pros

- **informative dash boards**
- **links with WileyPLUS gradebook**
- **proficiency, confidence, diagnostic**
- **extends WileyPLUS problem set**
- **local technical support**
- **free of charge add-on**

Cons

- **separate development team**
- **long time for support to response**
- **limited access to visible data**
- **data format non-standard**
- **external product**
- **more a trial than a solid product**

What did you value most about the assessment structure in this subject (50% Orion, 30% prac, 20% exam)?

“Worked well for me. Engaging.”

“I think Orion is a fantastic tool but I would have used it more if the punishment for answering incorrectly was not so bad.”

“I liked that I could start where I had left off.”

“Made it easier to let me do it at my own pace. Since it was online I could do more of it from home.”

“Get marked on questions you do at home [opposed] to other subjects [where] you get marked mostly on test and assignments.”

“If something was due in another subject I could focus on that then come back to Orion knowing it’s not due yet.”

“It worked very well for me because I tend to stress when a final exam has a huge percentage weight.”

In your own opinion and from experience you may have had in other subjects, do you believe you had deeper learning experience this way [adaptive] compared to an exam-based assessment ?

Other subject you won't do many questions for each chapter but for this subject I was able to do many questions on all chapters which gave me a good depth of knowledge.

It was different because I was able to see improvements on a weekly basis. I didn't do physics at school. So this assessment task really helped me because I was able to do heaps of questions and track my progress.

Also, having a big focus on [problem solving] practise skills is much more valuable for overall learning.

I found I was much more involved with this style of assessment.

Were there any other skills you developed throughout the process of this homework assessment task?

Time management

Solve problems quicker

Confidence when problem solving

Visualise and solve problems quicker

Individualised just-in-time feedback

“I liked that Dr Jurgen was able to send weekly progress reports to not only give us the proficiency scores but where we are sitting in the subject in order to get a pass. It was a source of motivation !!”



Q & A